Security Competence as an Integral Part of Competence-Based Learning Approach: Russian and European Experience

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ABSTRACT. Since the end of the 20th century, educational standards have been changing, and many countries have switched from a traditional approach to a competence-based one. Despite the numerous works on the issue, there is still no standardized definition of competencies and their components. The study of the competencies, including new digital competencies, is necessary because education within the framework of the competence-based approach helps to reduce the gap between theory and practice, which makes it possible to train specialists ready to work in a new digital era, where one of the main tasks is the formation of the digital economy. The digital economy implies the development and creation of digital, high-tech products within the country. The ability to safely operate digital products is reflected in security competence, which is important not only in professional activities but also when using the internet, computer programs, and so on, for personal purposes. In this article, we will analyze different approaches to the concept of security competence within the prism of competence-based learning in Russia and Western countries, including European and American experiences.

KEYWORDS: competence / competence-based approach / security competence / digital economy

COMPETENCIA EN SEGURIDAD COMO PARTE INTEGRAL DEL ENFOQUE DE APRENDIZAJE BASADO EN COMPETENCIAS: EXPERIENCIA RUSA Y EUROPEA

RESUMEN. A partir de finales del siglo xx, los estándares educativos han ido cambiando y muchos países han pasado del enfoque tradicional al basado en competencias. A pesar de los numerosos trabajos sobre el tema, aún no existe una definición estandarizada de competencias y sus componentes. El estudio de las competencias, incluidas las nuevas competencias digitales, es necesario porque la educación en el marco del enfoque por competencias ayuda a reducir la brecha entre la teoría y la práctica, lo que permite formar especialistas preparados para trabajar en una nueva era digital, donde una de las principales tareas es la formación de la economía digital. La economía digital implica el desarrollo y la creación de productos digitales de alta tecnología dentro del país. La capacidad para operar productos digitales de manera segura se refleja en la competencia en seguridad, que es importante no solo en las actividades profesionales, sino también cuando se usa internet, programas de computadora, etcétera, para fines personales. En este artículo analizaremos diferentes enfoques del concepto de competencia en seguridad dentro del prisma del aprendizaje basado en competencias en Rusia y los países occidentales, incluida la experiencia europea y estadounidense.

PALABRAS CLAVE: competencia / enfoque basado en competencias / competencia en seguridad / economía digital

1. COMPETENCIES: INTRODUCTION

Between the end of the 20th and the beginning of the 21st century the traditional education systems have been notably modified. The competence-based approach is becoming particularly relevant, making the learning process more elaborate and complex than just knowledge acquisition and assessment. It aimes to develop a teaching concept that helps graduates take part in further professional activities and be able to update and constantly improve their level of knowledge, skills and abilities. The competence-based approach and competencies are the most important basis for solving the problem of integrating a young specialist into the common European labor market, the aim that traditional models of higher education cannot satisfy. In this article, we will analyze the basic concepts and theories of the competence-based approach and focus on its specific segment, digital competencies and, in particular, security competence. In the second part of the article, we will focus on examining the components of the security competence. We will try to find out what different authors mean by this competence and whether the competence is ranked by levels and considered through the prism of knowledge and skills and abilities or not. We have studied a wide range of literature both in English and Russian. The study mainly uses the comparative method of research.

2. THE BACKGROUND OF THE PROBLEM

The first steps towards the competency-based approach were made in the USA in the sixties. Then the leading role in the process of modernization was played the National Skill Standards Act (1994) that established the National Skill Standards Board. This was the first serious attempt to classify and define competencies, and introduce adequate methods to assess students within the framework of the competence-based approach to education. In 1997, the Dearing Report appeared in the UK, raising some points of continuous learning and skills improvement of specialists throughout their lives. As a result, the Learning Skills Council was created. Australia (Technical and further education courses - TAFE) and New Zealand (the National Qualification Framework) joined this process. The last-named country introduced an eight-step system teaching and student assessment sstem within the competence-based approach paradigm (Voorhees, 2001). If the competence-based and practice-oriented approaches were considered the prerogative of secondary vocational institutions in the initial perriod, for the last 20 years they have been actively adopting for higher education. For example, in the United States, in concordance with the National Skill Standard Board several colleges introduced the principles of the competence-based approach for bachelor's programs, such as Western Governors University, Kings College, Alverno College, Northwest Missouri State University (Voorhees, 2001). Researchers and teachers at that period concentrated their forces on defining of competency-based approach and developing systems for assessing success for any given competence applicable to higher education (Kate Ford, 2014).

Russia has also joined the process of modernizing the education system inherited from the Soviet period. As a result, the Bologna Declaration on the formation of common European educational space came into force. This Declaration was signed by Russia in September 2003, although the attempts in this area were done even before. One of the main principles of the Bologna Declaration is the competence-based approach to assessing learning outcomes, which is affirmed in the educational policy of the Russian Federation, in the Federal State Educational Standard and the State Program for the Development of Education 2013-2020 and 2020-2025. This approach is aimed at "overcoming the main drawback of the existing system of professional training: the gap between theoretical and practical aspects of the professional activity formed in the course of training" (Nyushchenko, 2012). The importance of this transformation can be illustrated with statistics data. Only 27,4% of the university graduates can get a job in their degree field due to the lack of practical focus of knowledge offered at the university and its weak correlation with the tasks and conditions of professional activities (Bordovskiy *et al*., 2001). There is an increasing gap between the quality of education and the growing number of competence requirements for specialists, and students do not associate higher education with real market competitiveness (Volkov *et al*., 2007).

3. WHAT IS COMPETENCE?

At the moment, there is no standardized definition of the concept of competence; each of them emphasizes this or that aspect of the term. The main components of the competencies, which the overwhelming majority of authors agree with, are knowledge, skills, and abilities (Sá & Serpa, 2020; Lasić *et al*., 2020; Periáñez *et al*., 2019; Rizza, 2014; Falloon, 2020; Gallego *et al.*, 2019; Tomczyk, 2020; Ferrari, 2013; Barragán-Sánchez *et al*., 2020; Carretero *et al*., 2017; Gusyatnikov *et al*., 2014; Bogatyreva, 2013). Some authors combine skills and abilities into one component (Sá & Serpa, 2020), defining it in a formula 'I know how to do and I can do it', others unite all three components and name it as the cognitive component of competence (Periáñez *et al*., 2019; Garafutdinova & Soloshenko, 2013). It is worthwhile noting that most authors identify more than only three main components of competence, such as knowledge, skills, and abilities. Even Though the fact that these three components do not raise doubts among the majority of authors, questions about other components that should be included and considered an integral part of competencies remain open. Some researchers emphasize the importance of personal qualities necessary for the performance of professional activities (for example, Common European Competence of Speaking in a Foreign Language), the motivational component (Sá & Serpa, 2020; Lasić *et al*., 2020; Rizza, 2014; Falloon, 2020; Ferrari, 2013; Barragán-Sánchez *et al*., 2020; Carretero *et al*., 2017), as well as the ability to apply knowledge and skills when solving both streaming tasks (Periáñez *et al*., 2019; Rizza, 2014; Tomczyk, 2020; Ferrari, 2013; Barragán-Sánchez *et al*., 2020; Carretero *et al*., 2017), and acting in abnormal situations (Periáñez *et al*., 2019; Falloon, 2020; Barragán-Sánchez *et al*., 2020; Carretero *et al*., 2017).

Some authors highlight a number of other components,such as experience (Sá & Serpa, 2020), emphasizing that it gives confidence and stability and allows work in difficult conditions. They also distinguish social experience as "the ability to understand oneself and others under the conditions of the dynamics of mental states, interpersonal relations and conditions of the social environment" (Gallego *et al*., 2019; Tomczyk, 2020). Others note that competence arises from self-development of the individual and his personal development, self-awareness, and reflection in the process of cognitive process (Nazmutdinov & Yusupova, 2013), stress the importance of learning and appropriating social norms, values, and attitudes towards their profession (Tsydypova *et al*., 2016).

NPEC workgroup gives the following definition – competency 'is a combination of skills, abilities and knowledge needed to perform a specific task (US Department of Education, report of the NPEC on Competency-Based Initiatives in Postsecondary Education, 2002). In Russian literature, this term has been expanded: competence 'is a combination of knowledge, skills, and abilities, a specialist's willingness for activity and the ability to carry out practical activities' (Pyrkova, 2015). The essential characteristics of competence are personality-determined qualities that are manifested by a specialist in his or her perception and the final results. Competence is an ability to apply knowledge, skills, and personal qualities for successful activities in a particular professional area (Tsydypova *et al*., 2016). In this study, we will use this as a working definition.

Researchers identify vital competencies that form the basis for professional activity in any field. They differ markedly from strictly educational competencies. There is no consensus on the issue of key competencies or even their number (from 3 to 37 positions).

4. FEATURES AND SPECIFICS OF TODAY'S COMPETENCE-BASED APPROACH TO LEARNING

We are currently in the sixth generation of competency-based programs. The term "competency-based approach" has been actively used in teaching methods for over a decade, including Russian researchers. It is a set of general principles necessary to determine the goals of education, the content selection, and the organization of the educational process (Lebedev O.E., 2004). The competency-based approach as a methodological guideline determines new methods and technologies of teaching, contributes to the development of students' independence, initiativity, creativity and critical thinking, and sets a benchmark for practical effective results.

State Educational Standard of Higher Professional Education in Russia defines the competency-based approach as "a method of modeling education results as norms of its quality" (Pyrkova, 2015). The peculiarity of the competence-based approach is that in the learning process, not only ready-made knowledge is acquired, but also the conditions for the

origin of this knowledge are traced. The methodology is based on learning through activity. This approach is necessary to eliminate the gap between theory and practice. In the context of education, the emphasis is placed on subjective experience and practice-oriented tasks. Students must learn to work with redundant information, independently select and structure it.

In the process of training, independent cognitive activity prevails, both individual and collective, and the ability to create your educational products. In this case, students should have the right to make mistakes, and the prevailing methods should be those that ensure personal self-development. In the competence-based approach, personal qualities that help a person become a successful member of society (positive self-esteem, tolerance, empathy, the ability to cooperate and self-respect, and innovation and creativity) come to the fore.

The competency-based approach helps to make education individually oriented and solves the problem connected with the personal characteristics of every single student's learning. Everyone can form so-called learning bundles at his or her own pace that are requested to solve this or that particular problem. Modern pedagogy is concerned with the definition and systematization of competencies, and combining them into bundles (Voorhees, 2001).

It is also essential that each competence at each level has a transpaent assessment system with precise results. Both the learning and assessment processes should be transparent and comprehensible to all participants.

Thus, the concept of competence of a specialist as a goal of education is much wider than knowledge, skills, and abilities. It is more capacious and includes, in addition to knowledge, skills, and abilities, individual motivational, cognitive, and behavioral components of a specialist, as well as ethical, social, and behavioral ones. In turn, professional competence is the readiness of an individual to mobilize personal resources (organized in a system of knowledge, skills, abilities and personal qualities) necessary to effectively solve professional tasks in typical and abnormal situations, including the value attitude of an individual these situations.

As for the Russian point of view on the problem, analyzing the current situation in the education system, Konstantinovsky *et al*. (2015) conclde that higher education becomes entrepreneurship, and the university is "not a temple of science, but a market place in the broadest sense of this concept." Under the influence of external factors, universities are transformed into economic corporations "which are managed as corporations associated with the production and dissemination of knowledge. All the components of the university structure are self-determined on the basis of characteristics of competitiveness and profitability" (Konstantinovsky *et al*., 2005). It is with the formation of the competence of future specialists that today the quality of higher education should be associated, which ensures the competitiveness of a specialist in the labor market.

5. SECURITY COMPETENCIES

Since the middle of the past century, there has been rapid development and spread of digital technologies that recently determined the development the pathway of the economy and society. The evolvement of the digital economy is one of the priority areas for most countries. The digital economy involves the development and creation of digital, high-tech products in the home country. As a result of these modifications, the requirements for modern specialists are changing and rising, and new digital competencies are becoming more relevant. The researchers in the field notice that today's pandemic has become another proof of the urgent need to develop digital competencies. Many business processes, including the educational process, have been transferred into the digital environment. According to estimates, even when all temporary restrictive measures are lifted, many of the online processes will remain in a digital environment (Sá & Serpa, 2020; Lazić, 2020; Barragán-Sánchez *et al*., 2020). For this reason, the acquisition of digital competencies in today's context is not a superfluity but a necessity. 'Digital competencies is the general term used to describe or explain the ability (of a citizen, a student, a teacher, etc.) to use information technology (IT) in a specific context' (Caroline Rizza, 2014).

Many definitions of digital competencies focus not only on the usage but on the effectiveness of IT (Falloon, 2020). The concept of effective use of technology includes not only the ability to use digital products but also to use them correctly and safely. Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. It's also known as information technology security or electronic information security[1].

The ability to operate digital products safely is reflected in *digital security competence, or security competence in the information society*. At this stage of technological development, the acquisition of security competence, even at different levels, is necessary not only for security professionals but also for employees in other areas. Most of the workforce in the world is employed in areas where, in one way or another, you have to work with digital data, computer programs and use the Internet. Acquisition of security competence is also important not only in professional activities but also when using the Internet, computer programs, and so on, for personal purposes.

Periáñez-Cañadillas *et al*. (2019) studied howdevelopment and improvement of digital competencies can influence the carrier of graduates. The connection between developed security competence, as a part of digital competencies, and the candidate's suitability for this or that job was established. The importance of security competence is also confirmed by the data on the growth of costs (losses) caused by IT crimes. The global cost of digital crime in 2015

1 For more information: *What is Cyber Security? Definition, Types, and User Protection*, Kaspersky, 2021

was 3 trillion US dollars; these costs will continue growing by 15% annually and will have reached 10.5 trillion US dollars by 2025. 95% of cybersecurity breaches are possible because of human error[2]. In addition, it is expected that by 2022 the global information security market will have reached 170,4 billion US dollars[3].

6. RESULTS

The importance of developing this competence among future specialists is beyond doubt; however, the questions of what is included in the security competence and how to develop and assess it remain open. The question of the list of components included in the security competence has not been widely discussed by researchers yet. We found several articles where the components of security competence are described. They are presented in table 1.

Table 1
Articles with components of security competence

Author	• Components of security competence	Comments
Gallego-Arrufat *et al*., 2019	• know how to interact through technologies, sharing of digital information and contents, • protect personal data, • protect health, • know the basic principles of netiquette, • understand digital identity, • be able to resist cyberbullying on social networks and Internet	The listed components are described in more detail in the article (since this description is quite capacious, we do not insert it completely here). The authors divide all components of competencies into 3 groups: knowledge, attitudes, abilities and practices.
Tomczyk, 2020	• be aware of technical safety while using media; • be able to assess of the credibility of online information; • perform safe interactions with other users; • respect anonymity; • create secure logins and passwords; • take into account copyright.	Authors consider these components, except for the last one, as a part of knowledge. The last component (copyright) is considered by the authors as a skill

(*continues*)

2 For more information: https://www.cybintsolutions.com/cyber-security-facts-stats/

3 For more information: https://www.gartner.com/en/documents/3889055

(*continuation*)

Ferrari, (2013)	• be able to protect own devices and • understand online risks and threats, • be aware of safety and security measures; • understand common terms of service, • use methods of active protection of personal data, • understand other's privacy, • protect yourself from online fraud, threats and cyber bullying; • avoid health-risks related with the use of technology in terms of threats to physical and psychological wellbeing; • be aware of the impact of ICT on the environment	Authors divide each component of the security competency into 3 levels and describe it separately (Foundation, Intermediate, Advanced). There is no division into knowledge, skills and abilities.
Carretero, Vuorikari, Punie, 2017	• protect devices and digital content; • understand risks and threats in digital environments; • know about safety and security measures; • have a due regard to reliability and privacy; • protect personal data and privacy in digital environments; • understand how to use and share personally identifiable • information while being able to protect oneself and others from damages; • understand that digital services use a "Privacy policy" to inform how personal data is used; • be able to avoid health-risks and • threats to physical and psychological wellbeing while using digital technologies; • be able to protect oneself and others • from possible danger in digital environments (e.g. cyber bullying) be aware of digital technologies for social well-being and social inclusion be aware of the environmental impact of digital technologies and their use	Authors divide each component of the security competency into 4 levels (Foundation, Intermediate, Advanced, Highly specialized). There is no division into knowledge, skills and abilities
Gusyatnikov, Bezrukov, Sokolova, 2014	• know trusted sources of information for solving problems in particular subject area; • know and comply with the requirements of legal acts in the field of protection of state, • commercial secrets and information • security in professional activities; • acquire methods of cybercrime prevention.	Authors indicate only knowledge and skills

(*continues*)

(*continuation*)

Bogatyreva, 2013	• be able to navigate the information flows, • identify potential threats associated with the selection, • assessment and protection from information prohibited for distribution among children (SK-1); • be able to analyze, • evaluate and select hardware and software • for protection of information in order to form an informationsafe environment for educational process (SK-2); • use effectively the set of measures to counter unauthorized information impact on a student's personality, • take into account the legal framework, • developed hardware and software tools for protecting information and in name of • commercial importance.	The author does not divide the components of the security competence into groups, but it can be traced that the components of the groups described are knowledge, abilities, skills

7. CONCLUSIONS

In the articles presented in table 1, some authors indicate among the components of competencies only knowledge, skills, and abilities; others do not carry out this division or indicate only some of the listed components (for example, only knowledge and skills). As described in the first part of this research, the main components of competencies, according to most authors, are knowledge, skills, and abilities, and many add different characteristics to this list (for example, personal qualities, experience, etc.) because the standard set cannot be perceived as complete and exhaustive.

According to the general principles of the competence-based approach to education, the same competence can be used in different ways by specialists from different fields and for solving a great variety of problems (Voorhees, 2001). For Ferrari (2013) and Carretero *et al*. (2017), the division of competence by levels is fundamental (for example, Foundation, Intermediate, Advanced), including while describing the security competence (the level of competence for IT professionals and a homemaker will differ significantly). The Internet and electronic devices will be used by groups of people in different ways, pursuing different goals. Among the works found only in the works of Ferrari (2013) (Foundation, Intermediate, Advanced) and Carretero *et al*. (2017) (Foundation, Intermediate, Advanced, Highly specialized), there is such a division; other authors do not consider it.

The training of competent members of society places new demands on the education system. The educational process organized in conformity with the competence-based

approach should ensure each person's entry into the culture and help to take place as a successful member of society. Based on the postulate that education is the basis for solving socio-economic problems of society, we consider it necessary to further deepen and clarify such concepts as competence, digital competencies, security competence. At the moment, as far as we know, there is no complete description of the security competence, which would consider knowledge, skills, and abilities along with additional components (experience, self-development, and personal growth, value orientation, etc.), as well as its division into levels (for example Foundation, Intermediate, Advanced). The development of security competence is an urgent task in nowadays' world, but the first stage to achieve it requires its full description with an indication of requirements ranked by levels.

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